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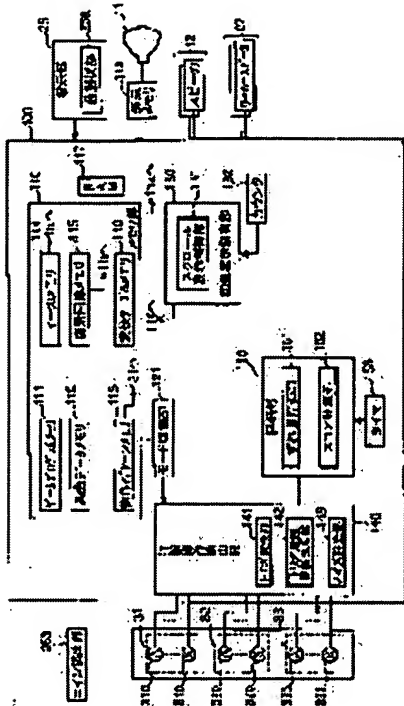
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(21)Application number : **2001-156067** (71)Applicant : **KONAMI CO LTD**

(22)Date of filing : **24.05.2001** (72)Inventor : **KITAKAZE YUSUKE**
MIDORIKAWA TAKESHI

(54) METHOD AND DEVICE FOR DECIDING PERCUSSION OPERATION AREA



(57)Abstract:

PROBLEM TO BE SOLVED: To make precisely decidable areas and to set various areas while eliminating the need for change to a mechanical part.

SOLUTION: A percussion area on a percussion surface is decided by providing 19 percussion sensors A to S which are decentralized and arranged at operation parts 31 (32, 33) recognized to have three areas Z1 to Z3 on the percussion surface and can detect whether a percussion is made. Further, the device is equipped with a trigger conversion part 141 which converts detection signals from the 19 sensors A to S detected at every 1/60 second into trigger information indicating whether percussion operation starts and a conversion table 116 which shows the relation all combination of pieces of trigger information corresponding to the 19 sensors A to S and an area determined as an

wherein the percussion surface is considered to be percussed.

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- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the whole music game equipment external view where stroke actuation field judging equipment is applied to this invention.

[Drawing 2] It is the decomposition perspective view showing the structure of a control unit.

[Drawing 3] It is drawing showing the relation between the sensor of a control unit, and a field etc., and plane view drawing in which (a) shows arrangement of a sensor, plane view drawing in which (b) shows arrangement of fields Z1-Z3, and (c) are drawings showing the translation table showing relation with the field determined as a sensor output state and those with actuation.

[Drawing 4] It is the block block diagram of the music game equipment with which this

invention is applied.

[Drawing 5] It is drawing showing the example of a game screen of music game equipment, and screen drawing where operator guidance of the (a) is carried out as one field namely, the fields Z1-Z3 -- by one criteria marker Ms to one conga, and (b) are screen drawings by which operator guidance is carried out by three criteria markers Ms to one conga as a field according to individual namely, the fields Z1, Z2, and Z3.

[Drawing 6] It is the flow chart which shows the stroke field judging routine of a stroke actuation detecting element.

[Drawing 7] It is drawing showing the modification 1 which consists of a field to the sensor placement shown in drawing 3 (a), and plane view drawing in which (a) shows the configuration of fields Z1-Z3, and (b) are drawings showing the translation table showing relation with the field determined as a sensor output state and those with actuation.

[Drawing 8] It is drawing showing the modification 2 which consists of a field to the sensor placement shown in drawing 3 (a), and plane view drawing in which (a) shows the configuration of fields Z1-Z3, and (b) are drawings showing the translation table showing relation with the field determined as a sensor output state and those with actuation.

[Drawing 9] The 3rd modification about sensor placement and a field is shown, and plane view drawing in which (a) shows the arrangement configuration of a sensor, plane view drawing in which (b) shows the configuration of fields Z1-Z3, and (c) are drawings showing the translation table showing relation with the field determined as a sensor output state and those with actuation.

[Drawing 10] Plane view drawing in which (a) shows the configuration of fields Z1-Z3 about the sensor placement and the field which show the 2nd operation gestalt of a control unit and a stroke actuation detecting element, and (b) are plane view drawings showing arrangement and the group of a sensor.

[Drawing 11] It is the functional block diagram of the stroke actuation detecting element corresponding to the stroke actuation detecting element shown in drawing 4 .

[Drawing 12] It is the flow chart which shows the stroke field judging routine of the stroke actuation detecting element concerning the 2nd operation gestalt.

[Drawing 13] It is drawing about the sensor placement and the field which show the modification of the 2nd operation gestalt, and plane view drawing in which (a) shows the configuration of fields Z1-Z3, and (b) are plane view drawings showing arrangement and the group of a sensor.

[Description of Notations]

10 Body of Game Machine

21, 22, 23 Simulation percussion instrument

31, 32, 33 Control unit

310 Sensor

311 Sensor Stowage

312 Sensor Location Holddown Member

313 Spacer

314 Top-Face Web Material

100 Control Section

110 Memory Section

111 Program Memory

116 Translation Table Memory

121 Mode Change-over Section
Z1-Z4 Field
140,240 Stroke actuation detecting element
141,241 Trigger converter
142,142 Trigger hysteresis update process section
143,243 Noise rejection section
244 Input Group Converter
245 Trigger Information Group Converter
246 Changed Trigger Hysteresis Update Process Section
247 Changed Trigger Hysteresis Noise Rejection Section

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention has the single stroke side where the check by looking of front faces, such as a controller used for a game machine etc., being equipped with two or more fields was enabled, and it is related in it to the stroke actuation field judging equipment which judges the stroke field on the stroke side over the actuation machine equipped with two or more stroke sensors which can detect the existence of a stroke distributed to this stroke side.

[0002]

[Description of the Prior Art] Conventionally, as a controller (actuation machine) of a game machine, one stroke side is divided into two or more fields, and the simulation percussion instrument which can be judged according to an individual is known in the stroke actuation to each field. The judgment of the stroke field by this controller was made to correspond to each field, and formed sensors, such as 1 or two or more mechanical-cable-type switches, and it was common to have carried out by whether which sensor detected the stroke. Moreover, the sway sensor and the photosensor are known as a sensor adopted as this simulation percussion instrument.

[0003]

[Problem(s) to be Solved by the Invention] like before, in the mode which arranged the sensor corresponding to the field, the construction material of a stroke side and thickness influence the sensitivity of a sensor, and there is individual difference of the sensibility of the sensor itself, and, especially as for this problem, it is influenced according to the individual difference of striking power etc. -- things -- ** Furthermore, in the mode using a sway sensor, delicate measurement called the difference of the oscillating detection time between a stroke location and the sensor of the neighborhood is always required on real time. Therefore, by detection by the sensor of the conventional mold corresponding to a field to the actuation machine which has a single stroke side configuration, there was a fixed limit in respect of exact field detection.

[0004] This invention was made in view of the above, and as all the information on an arrangement sensor is used for detection of the actuation field to the actuation machine which has a single stroke side configuration, while making an accurate field judging possible, it aims at providing the stroke actuation field judging approach in which dealing

with various field setting out is easily possible, and its equipment, making modification into a mechanical part unnecessary.

[0005]

[Means for Solving the Problem] This invention according to claim 1 has the single stroke side where the check by looking of the front face being equipped with i fields was enabled. It is stroke actuation field judging equipment which judges the stroke field on the stroke side over the actuation machine equipped with the stroke sensor of n ($>i$) individual which can detect the existence of the stroke distributed to this stroke side. A trigger conversion means to change into the trigger information which gets to know the existence of initiation of stroke actuation from the detecting signal from each of n stroke sensors detected for every predetermined time. It has the translation table showing relation with the field determined were hit all the combination of the trigger information corresponding to n stroke sensors, and among said i pieces.

[0006] Invention according to claim 7 has the single stroke side where the check by looking of the front face being equipped with i fields was enabled. It is the stroke actuation field judging approach of judging the stroke field on the stroke side over the actuation machine equipped with the stroke sensor of n ($>i$) individual which can detect the existence of the stroke distributed to this stroke side. It changes into the trigger information which gets to know the existence of initiation of stroke actuation from the detecting signal from each of n stroke sensors detected for every predetermined time. From this trigger information, a field is determined through the translation table showing relation with the field determined were hit all the combination of the trigger information corresponding to n stroke sensors, and among said i pieces.

[0007] According to these invention, if a detecting signal is incorporated from each of n stroke sensors for every predetermined time, this detecting signal will be changed into the trigger information which gets to know for every stroke sensor at the shift event to a condition with a stroke from a stroke-less condition, i.e., the existence of initiation of stroke actuation. The translation table showing relation with the field determined were hit all the combination of the trigger information corresponding to n stroke sensors and among said i pieces on the other hand is prepared beforehand, and the actual trigger information on each stroke sensor obtained by said conversion is led to this translation table, and outputs corresponding field information. The content of the translation table is created based on location survey, and the field information outputted by this does not have recognition and the sense of incongruity of a player, and let it be the field by which stroke actuation was carried out. Moreover, dealing with field setting out various only by changing the content of the translation table only becomes easily possible, without adding modification in any way to the structure of a stroke sensor, and arrangement, i.e., a mechanical part.

[0008] according to invention according to claim 2, it is characterized by to have a trigger hysteresis storing means store the trigger information acquired for every predetermined time of said by the count of predetermined, and a noise-rejection means remove the trigger information on those with a stroke predetermined within a time from the trigger information on those with initiation of the last stroke actuation using the stored trigger hysteresis information in stroke actuation field judging equipment according to claim 1. According to this configuration, the trigger information acquired for every predetermined time is stored in the direction of time series in updating by the count of predetermined.

When the last trigger information and this trigger information have a relation within predetermined time using this trigger hysteresis information, it is considered that this trigger information is a noise and it is removed. Thereby, the so-called chattering is prevented.

[0009] According to invention according to claim 3, in stroke actuation field judging equipment according to claim 1 or 2, it is characterized by said actuation machine being the controller for game machines which imitated the percussion instrument. According to this configuration, though it is one percussion instrument which has a single stroke side, by having enabled the stroke judging of two or more fields, it becomes possible to brew the ambient atmosphere of a music performance, and it uses as a music game and becomes suitable.

[0010] According to invention according to claim 4, in stroke actuation field judging equipment according to claim 1 to 3, it is characterized by said single stroke side consisting of the 3rd field which nothing and said field are the 1st and 2nd field symmetrical at a near side, and the remainder about a round shape, and makes a center and front side a subject. According to this configuration, it becomes possible to brew presence that percussion instruments, such as conga and a drum, are played.

[0011] According to invention according to claim 5, it has the single stroke side where the check by looking of the front face being equipped with i fields was enabled. It is stroke actuation field judging equipment which judges the stroke field on the stroke side over the actuation machine equipped with the stroke sensor of $n (>i)$ individual which can detect the existence of the stroke distributed to this stroke side. A trigger conversion means to change into the trigger information which gets to know the existence of initiation of stroke actuation from the detecting signal from each of n stroke sensors detected for every predetermined time, The 1st conversion means which carries out OR processing and assigns each trigger information corresponding to n stroke sensors to the group by whom it was beforehand set up of the groups of $m (n>m>i)$ individual, It has the translation table showing relation with the field determined were hit among all the combination of m groups' changed trigger information, and i fields.

[0012] According to invention according to claim 8, it has the single stroke side where the check by looking of the front face being equipped with i fields was enabled. It is the stroke actuation field judging approach of judging the stroke field on the stroke side over the actuation machine equipped with the stroke sensor of $n (>i)$ individual which can detect the existence of the stroke distributed to this stroke side. It changes into the trigger information which gets to know the existence of initiation of stroke actuation from the detecting signal from each of n stroke sensors detected for every predetermined time. Each trigger information is changed into the group to whom it corresponds of the groups of $m (n>m>i)$ individual assigned to n stroke sensors, respectively by OR processing. From trigger information [finishing / this conversion], a field is determined through the translation table showing relation with the field determined were hit among all the combination of m groups' changed trigger information, and i fields.

[0013] According to these invention, the detecting signal from each of n stroke sensors detected for every predetermined time is changed into the trigger information which gets to know the existence of initiation of stroke actuation. Each changed trigger information is changed into the group to whom it corresponds of the groups of $m (n>m>i)$ individual to whom n stroke sensors were assigned, respectively by OR processing. The mode using

the translation table with which it was prepared for OR processing is sufficient as this conversion. It is led to the translation table showing relation with the field determined that trigger information [finishing / conversion] was hit among all the combination of m groups' changed trigger information, and i fields, and a field is determined.

[0014] According to invention according to claim 6, it sets to stroke actuation field judging equipment according to claim 5. The 2nd conversion means which carries out OR processing and assigns either of m groups each detecting signal of n stroke sensors, A changed trigger hysteresis storing means to store the changed trigger information which is the changed trigger information acquired with said 1st conversion means, and was acquired for said every predetermined time by the count of predetermined, It is characterized by having a noise rejection means to remove the changed trigger information on those with initiation of the stroke actuation within the predetermined setup time from the changed trigger information on those with initiation of the last stroke actuation, using the stored changed trigger hysteresis information. According to this configuration, by the 2nd conversion means, each detecting signal of n stroke sensors carries out OR processing, and is assigned to either of m groups, and the changed trigger information which is the changed trigger information acquired with said 1st conversion means, and was acquired for said every predetermined time is stored in a changed trigger hysteresis storing means by the count of predetermined. And the changed trigger information on those with initiation of the stroke actuation within the predetermined setup time is removed from the changed trigger information on those with initiation of the last stroke actuation as a noise using the stored changed trigger hysteresis information.

[0015]

[Embodiment of the Invention] Drawing 1 is the whole music game equipment external view where stroke actuation field judging equipment is applied to this invention. This game equipment consists of a body 10 of a game machine, and a controller case 20 arranged in this side.

[0016] The body 10 of a game machine is equipped with the case of an abbreviation rectangular parallelepiped configuration, and it is arranged with the position in which the monitor 11 of the necessary size which displays an image on the front center section inclined somewhat back, and as the direction of a look of the player under play and monitor display 11A cross at right angles, he is trying to present a legible game screen. It decorates, the section is ****(ed) and the loudspeakers 12 and 12 for which the conga which is a percussion instrument was imitated and which carry out the voice output of the music at the position of symmetry are attached in the head-lining section of the body 10 of a game machine towards the front at left and right laterals.

[0017] Three simulation percussion instruments 21, 22, and 23 which imitated conga are installed in the longitudinal direction side by side in the form where the controller case 20 is carried in the base frame section 24. The simulation musical instruments 21, 22, and 23 have the same configuration substantially, and those height is in the condition attached before the game machine box object 10, and is set as the soffit location of a monitor 11, and the corresponding dimension. The directions section 25 which has a panel configuration is arranged in the upper part of the base frame section 24, and the selection carbon buttons 251 and 251 are formed in the central definite carbon button 250 and its right and left. the directions section 25 mentions later -- as -- game initiation -- hitting -- screen 11A of a monitor 11 -- selectable -- game difficulty (mode) and a sound -- since an

easy music name is displayed -- among those -- since -- it is used in order to choose the difficulty and the music name for which it asks. In addition, it is also possible to adopt the method which specifies the selections currently displayed on this press part by replacing with the directions section 25, arranging the transparent tablet which used piezo-electric material for screen 11A in piles, and pressing with the finger of a player etc.

[0018] The coin charge section 26 is formed in the front section of the central simulation percussion instrument 22. The coin charge section 26 has the upside coin slot 261 and the lower return opening 262, and the coin detecting element 263 (refer to drawing 4) which detects charge coin is formed all over the internal coin path of the figure abbreviation which is open for free passage to a coin slot 261. The return opening 262 is an object for the blowdown when being judged with imitation by for example, return directions or truth-or-falsehood judging. The loudspeaker 27 for woofers is arranged in the front face of the simulation percussion instruments 21 and 23 on either side, respectively, and the output of powerful heavy bass is enabled immediately near the player.

[0019] Moreover, the conga struck in the palm strikes in the head-lining section of the simulation percussion instruments 21, 22, and 23, and the control units 31, 32, and 33 which carried out the **** form are attached in it in the field, respectively. That in which control units 31-33 have the same structure is adopted.

[0020] Drawing 2 is the decomposition perspective view showing the structure of a control unit 31 (32 33). It is equipped with the sensor stowage 311, the sensor location holddown member 312, a spacer 313, and the top-face web material 314 from a lower part side, using a control unit 31 as the structure which makes a sensor 310 and this sensor operational.

[0021] The mechanical switch is adopted, and head 310a has the structure which can appear frequently by external force, and the sensor 310 consists of these operation gestalten so that an ON signal may be outputted in the state of devotion. The sensor stowage 311 is a circular container and performs receipt of the base of a sensor, and necessary wiring inside. The sensor location holddown member 312 has disc-like, and the bis-stop etc. is carried out to the top face of the sensor stowage 311. Two or more hole 312a is concentrically formed in a predetermined location, for example, a core, and its perimeter at this sensor holddown member 312, and the sensor 310 is being fixed to such hole 312a in the state of fit-in. With this operation gestalt, 19 sensors 310 are used and the detail of an arrangement location is mentioned later. A spacer 313 is the disk which has necessary thickness, and hole 313a is formed in hole 312a of the sensor location holddown member 312, and a corresponding location. The sensor 310 is set as the height in which head 310a or its part projects from the top face of a spacer 313. The top-face web material 314 consists of ingredients by the palm of a player, such as a circular product made of resin which strikes, forms a field (stroke side) and has [single] elasticity. The top-face web material 314 is an ingredient [comparatively elasticity / as what strikes and controls the oscillation at the time if possible], or forming by the thin layer is desirable.

[0022] Borderline 314a is written in order to enable a check by looking of three fields at the top-face side of the top-face web material 314. Borderline 314a is divided to the field Z1 which are the symmetrical field Z2 which has the circular top-face sheet member 314 and this cardiac configuration for a stroke side by the near side, a field Z3, and the

remainder, and makes a center and front side a subject, as shown in drawing 2 and drawing 3 (b).

[0023] Drawing 3 is drawing showing the relation between the sensor of a control unit, and fields Z1-Z3 etc., and plane view drawing in which (a) shows arrangement of a sensor, plane view drawing in which (b) shows arrangement of fields Z1-Z3, and (c) are drawings showing the translation table showing relation with the field determined as a sensor output state and those with actuation. In addition, the alphabet is given to a sensor and the individual expression is carried out. In a field Z1, from drawing 3 (a) and (b), Sensor A, its sensor B-G of regular intervals [perimeter] immediately of a center position, A total of 14 of sensor H-K and Q-S are mostly contained in the outermost periphery at equal intervals. In a field Z2, it is a center of the direction of a path. At equal intervals to a circumferential direction Sensor K-N (-- however, by [one half]) is mostly contained with a another province region, and Sensors K and N are considered as the arrangement relation are related of 19 pieces in the field Z3 with this operation gestalt with which it is a center of the direction of a path, and sensor N-Q (almost a another province region [However, the sensors N and Q] and by one half) is contained in a circumferential direction at equal intervals.

[0024] Although drawing 2 does not show, the output signal line is formed according to the individual, and he is trying to be led by each sensor A-S at the stroke actuation detecting element 140 (to refer to drawing 4) to which the shown ON signal, an OFF signal "1", i.e., data, and "0" are outputted, and mention each sensor to actuation existence later, respectively.

[0025] Here, the music game equipment with which this invention is applied is explained using the block block diagram of drawing 4 . The control section 100 which consists of computers etc. is arranged in the internal proper place of the body 10 of a game machine. A control section 100 processes the motion control of this game equipment in generalization.

[0026] A control section 100 is equipped with RAM117 for storing temporarily the memory section 110 and processed data which memorized various data required for game progress program data, others, and this music game including a stroke actuation field judging program. It carries out that the memory section 110 makes the built-in type which stores program data or the program memory 111 of a removable cartridge type, and musical piece data correspond with the mode etc. It corresponds to the musical piece data memory 112 and the musical piece data for every music which are memorized by two or more music. Directions of the stroke actuation to control units 31-33 The actuation pattern which consists of timing information to perform It has the translation table memory 116 which memorizes the actuation pattern memory 113 to memorize, the marker memory 114 which memorizes the various markers who display on a screen, the background-image memory 115 which memorizes the background image under a game and demonstration, and the various translation tables for a stroke actuation field judging. As a record medium which stores a game program, CD-ROM, a floppy (trademark) disk, a hard disk, etc. are sufficient. It is developed by RAM117 and a program is performed by the inside of a game. In addition, when a game program is transmitted from the external device of figure abbreviation (download), program memory 111 turns into rewritable memory.

[0027] The performance sound of musical instrument conga is not contained among the

musical piece data in one music indicated by the musical piece data memory 112. The performance sound of musical instrument conga supports the actuation pattern, and when having operated it with sufficient timing to the control unit to which a player corresponds to an actuation pattern is judged so that it may mention later, it is memorized as another data so that the sound as a performance sound which should exist may output.

[0028] The marker memory 114 memorizes the criteria marker Ms and the guide marker Mg (refer to drawing 5 above) as image data. The background-image memory 115 memorizes the data of the various background-images adopted as a dance character and other production while displaying the line which shows the train which has necessary width of face in the vertical direction displayed on screen 11A of a monitor 11, and by which a scrolling indication of the guide marker Mg is given.

[0029] The mode change-over section 121 makes signal processing in the below-mentioned stroke actuation detecting element 140 to the manipulate signal from control units 31-33 perform according to selection processing of the difficulty and music (and actuation pattern corresponding to this) which correspond in response to the mode signal from the directions section 25, and the actuation pattern chosen further. The directions section 25 has selection section 25a of difficulty selection or music selection. Enabling [from] assignment of the level for which it asks from the middle (Normal) game of the selection of difficulty by selection section 25a among the game of ** (Easy) as shown in drawing 5 (a), and the game of difficulty (Hard) as shown in drawing 5 (b), music selection of selection section 25a chooses the music for which it asks out of the music prepared corresponding to the selected level of difficulty.

[0030] The image display control section 130 has the scrolling display and control section 131 which makes the guide marker Mg etc. indicate in the predetermined direction by migration on screen 11A of a monitor 11 while performing drawing processing of still pictures (it contains criteria marker Ms), such as a background image and a dance image, and an animation (for example, mambo dance actuation of a character), as shown in drawing 5. in addition, operator guidance of drawing 5 (a) is carried out as one field namely, the fields Z1-Z3 -- by one criteria marker Ms to one conga, and operator guidance of drawing 5 (b) is carried out by three criteria markers Ms to one conga as a field according to individual namely, the fields Z1, Z2, and Z3.

[0031] The scrolling display and control section 131 is for reading the actuation pattern corresponding to the selected music from the actuation pattern memory 113 one by one based on the timing information, and making a scrolling display perform as a guide marker Mg (or continuous-hits guide marker Ma) on screen 11A of a monitor 11. The timing information by which reading appearance was carried out from the actuation pattern memory 113 is transposed to the guide marker Mg who is image data by the marker memory 114.

[0032] The scrolling display and control section 131 is carried out as [shift / read-out timing / with a predetermined time interval / one by one] (when carrying out scrolling migration of the guide marker Mg etc. caudad from the upper part of screen 11A, it is behind one by one like), reads the guide marker Mg from the marker memory 111, and is made to write him in display memory 11a as a scrolling image. In thus, the form superimposed to the criteria marker Ms displayed on the lower proper place of the image which is not scrolled and screen 11A While the sequential transfer of the guide marker Mg scrolled is carried out at display memory 11a, and reading appearance of the content

of display memory 11a is repeatedly carried out by the still better known display scan means with periods, such as 1 / 60 etc. seconds, and being displayed In screen 11A, it is indicated by scrolling at the rate in alignment with Il Tempo of the musical piece by which the guide marker Mg etc. is performed toward the downward criteria marker Ms from the upper part on the screen 31, and a background image etc. is displayed as an animation as a still picture again.

[0033] In response to the mode signal from the mode change-over section 121, the stroke actuation detecting element 140 carries out signal processing of the piped-mode-operation signal from each sensor each of control units 31-33 according to difficulty, i.e., the mode, and leads it to the assessment section 150. For example, when a control unit 31 is explained to an example, in "difficulty mode", it is a deed about judgment processing of an actuation field according to an individual to fields Z1, Z2, and Z3. In "*** mode", judgment processing of an actuation field is performed by making fields Z1, Z2, and Z3 into one. "Inside mode" is the mode in which the remainder is made into "*** mode" by any one or 2 of three control units 31-33 becoming "difficulty mode."

[0034] Moreover, the trigger converter 141 which changes the stroke actuation detecting element 140 into the trigger information which gets to know the existence of initiation of stroke actuation from the piped-mode-operation signal from sensor A-S at every predetermined time (for example, 1 / 60 seconds), The trigger hysteresis update process section 142 stored while updating to RAM117 by making trigger information on the latest a part for the count of predetermined, for example, past 8 batch, (namely, 8 / 60 seconds) into trigger hysteresis information, If it is a thing within predetermined time, it has the noise rejection section 143 which considers that this is a chattering noise and removes it, and consists of trigger information from which the trigger information acquired this time using the stored trigger hysteresis information is acquired by the latest.

[0035] In addition, the stroke actuation detecting element 140 is incorporated as "1" and "0" signals for processing of the piped-mode-operation signal ON from sensor A-S, and OFF, and the trigger converter 141 generates a signal "1" as stroke actuation initiation, only when this signal changes from "0" to "1." The field information supposed that the trigger information after processing by the noise rejection section 143 was led to the translation table stored in the translation table memory 116 which shows relation with the field determined that stroke actuation was carried out [from], and was operated among three, all the combination of the trigger information corresponding to sensor A-S and fields Z1-Z3, is outputted.

[0036] It has specified whether drawing 3 (c) shown previously shows an example of this translation table, supports the combination (19th power of 2) of "0" which may appear from sensor A-S, and the trigger information generated from "1" signal, and determines the field of a gap as an actuation field. The signal "0" of the fields Z1-Z3 for right 3 train of a translation table and "1" are the contents determined in the configuration of drawing 3 (a) and (b) from the result obtained by sensor A-S through the stroke actuation experiment to the a large number part in each field, and are a signal. Let the field shown by "1" be a decision field.

[0037] The assessment section 150 evaluates correlation with the actuation timing to the control units 31-33 of a player, and is equipped with the right control unit by the timing and the player which correspond with the criteria marker Ms or a control unit and the amount assessment section 151 of gaps to a field that strikes and detects the amount of

gaps with timing (equivalent to time amount), and the score count section 152. The score count section 152 carries out sequential addition for every actuation timing in consideration of the score according to assessment of the coincidence degree by the amount assessment section 151 of gaps, and the score "22940" is displayed on the upper left of screen 11A in drawing 5 (a).

[0038] First, it is indicated by scrolling with the gestalt of the guide marker Mg and the continuous-hits guide marker Ma in an actuation [of the playback output of the musical piece data of the music which processing of a stage play was performed and was chosen after reception of music selection ended, when processing of this music game was explained briefly being carried out as music through a loudspeaker 12 and 27 grades, and corresponding synchronizing with the performance of music] pattern (drawing 4). for example, the control unit which as for a player corresponds to the coincidence timing of the guide marker Mg and the criteria marker Ms so that it may suit -- it is operated by striking.

[0039] By stage processing, by drawing 5 (a), it is a game screen when ** mode is chosen, and the criteria marker Ms corresponding to control units 31-33 is treated as three kinds of manipulate signals, without distinguishing three pieces Z1-Z3, i.e., three fields of each control unit. The criteria marker Ms corresponding to all the control units 31-33 in drawing 5 (b) classifies into three fields Z1-Z3, is displayed, and is treated as nine kinds of manipulate signals, respectively.

[0040] Moreover, in stage processing, it strikes, actuation shifts and it is measured in the amount assessment section 151, and if it is in predetermined time, the result which receives the field to which the corresponding control unit by coincidence timing and player of the guide marker Mg and the criteria marker Ms or a control unit corresponds and which the score was computed and was integrated in the score count section 152 corresponding to time difference will be displayed on a screen.

[0041] Drawing 6 is a flow chart which shows the stroke field judging routine of a stroke actuation detecting element.

[0042] First, it is a manipulate signal from 19 sensor A-S (here, generally they may be n pieces) a predetermined time (1 / 60 seconds) period, and incorporation of the input In (in addition, suffix n expresses the sensor number in this operation gestalt) made binary is performed (step ST 1). Subsequently, the trigger information Tn (0->1) is generated from this input In and the last input signal In' (step ST 3), and an update process of the trigger hysteresis Hn is performed from n more trigger information Tn (step ST 5). With this operation gestalt, while storing the trigger hysteresis Hn of past 8 batch serially by the trigger hysteresis update process section 142, the trigger information Tn newly acquired this time is replaced with and memorized to the trigger information Tn of 8 times ago.

[0043] Then, processing which removes the trigger information (inside of fixed time amount) Tn as unnecessary information is performed using the trigger hysteresis Hn (step ST 7). That is, the noise-rejection section 143 computes the time difference to the trigger information Tn by which updating storage was carried out from the last trigger information Tn with reference to the trigger hysteresis Hn this time, and when calculation results are 3 / less than 60 seconds, this trigger information performs processing which rewrites this to clearance, rewrites this trigger information to "0" as a chattering signal originating in the structure of the sensor section, the actuation situation of a player, etc., and is updated. For example, even if it is one stroke actuation as consciousness of a

player, in contact with the top-face web material 314, reverberation etc. is altogether considered by coincidence, and two or more fingers (striking member) which hit the top-face web material 314 remove as a noise the signal which overlaps this short time and is produced.

[0044] Trigger information (Tn) by which chattering clearance was carried out is made into the final result, it is led to the table memory shown in drawing 3 (c) (step ST 9), and the information which shows a corresponding field is outputted to the assessment section 150.

[0045] Drawing 7 is drawing showing the modification 1 which consists of fields Z1-Z3 to the sensor placement shown in drawing 3 (a), and plane view drawing in which (a) shows the configuration of fields Z1-Z3, and (b) are drawings showing the translation table showing relation with the field determined as a sensor output state and those with actuation. As shown in drawing, fields Z1 are the circular parts of abbreviation 1 / 2 radius of the top-face web material 314, and fields Z2 and Z3 are the periphery sides, and are equally divided into two (or a longitudinal direction is sufficient) by the cross direction. Sensor A-G is contained to a field Z1, and sensor H-S of a re-periphery is arranged in the center of the direction abbreviation of a path of fields Z2 and Z3.

[0046] Drawing 8 is drawing showing the modification 2 which consists of fields Z1-Z4 to the sensor placement shown in drawing 3 (a), and plane view drawing in which (a) shows the configuration of fields Z1-Z3, and (b) are drawings showing the translation table showing relation with the field determined as a sensor output state and those with actuation. As shown in drawing, fields Z1-Z4 are divided into the radial the 4th grade.

[0047] A stroke field can be judged proper with the translation table of drawing 7 (b) and drawing 8 (b) also according to these modifications 1 and 2. Moreover, since it will end only with changing the written top-face web material 314, without changing the sensor placement configuration of drawing 3 (a), i.e., the once set-up arrangement of a sensor, in any way if the content (creating beforehand) of the translation table is changed so that it may correspond to the changed top-face web material 314, it becomes possible to perform field modification setting out easily.

[0048] Drawing 9 shows the 3rd modification about sensor placement and a field, and plane view drawing in which (a) shows the arrangement configuration of a sensor, plane view drawing in which (b) shows the configuration of fields Z1-Z3, and (c) are drawings showing the translation table showing relation with the field determined as a sensor output state and those with actuation. As shown in drawing (b), fields Z2 and Z3 are formed in a configuration symmetrical with a part of near side of the top-face web material 314, and the field Z1 is made into the configuration including the remainder, i.e., a center, and the front. As shown in drawing (a), while the number of a sensor is 15 of sensor A-O and being arranged at the symmetry at right and left Sensors G, L, and N are arranged [a field Z2] at abbreviation regular intervals at a hoop direction. In a field Z3 Sensor I M and O arrange to a hoop direction at abbreviation regular intervals -- having -- a field Z1 -- a core -- to the perimeter, Sensors D, E, J, and K are arranged at right and left, and Sensors A and B are arranged for Sensor H at Sensors C and F and front right and left. As shown in the 4th (arrow-head location) line from on the table of drawing (c), supposing only Sensors N and O turn on and it is outputting "1" as trigger information, the stroke location at this time is made into the field Z1. This is because to treat is more natural noting that a player has recognition that the field Z1 occupies near a center,

therefore a field Z1 is hit, when stroke actuation of the right-and-left mid gear is carried out, even if it is a near side. This is the same also in drawing 3 (c) and drawing 7 (b). Moreover, in drawing 8 (b), when at least three or more fields turn on, you may treat noting that a field Z1 is operated (or a field Z4).

[0049] Drawing 10 - drawing 13 show the 2nd operation gestalt of a control unit and a stroke actuation detecting element. (a) is plane view drawing in which drawing 10 shows the configuration of fields Z1-Z3 about sensor placement and a field, and plane view drawing in which (b) shows arrangement and the group of a sensor. The configuration of a field is the same as that of what is shown in drawing 3 (b), and bilateral symmetry. Sensors total 14 with the 2nd operation gestalt. The arrangement As shown in drawing 10 (b), by bilateral symmetry in a field Z1 The sensor A1 as an A group - A4 on right-hand side to left-hand side the sensor B1 as a B group - B4 The sensor D1 of D group located in the sensor C1 of C group located in a boundary with the fields Z1 and Z2 which become right-and-left both sides from one sensor, respectively, and a boundary with fields Z1 and Z3 The sensors E1 and E2 of E group in the field Z2 which becomes the left front right from two sensors, respectively, and the sensors F1 and F2 of F group in a field Z3 have been arranged, and it has distributed to a total of six groups with the 2nd operation gestalt.

[0050] Drawing 11 is the functional block diagram showing the stroke actuation detecting element 240 corresponding to the stroke actuation detecting element 140 shown in drawing 4 , and it consists of the input group converter 244, a trigger information group converter 245, the changed trigger hysteresis update process section 246, and the changed trigger information noise rejection section 247 while it contains the trigger converter 241 which has the same function as drawing 4 , the trigger hysteresis update process section 242, and the noise rejection section 243.

[0051] The input group converter 244 carries out OR processing, and assigns each input for every predetermined time corresponding to 14 sensors (generally n pieces) to the group by whom it was beforehand set up of the six groups (generally m (<n) individual). For example, when only a sensor A2 shows input "1" about A group, it is referred to as "1" as input as an A group. In addition, it is $m > i$ (i expresses the number of fields and is 3 at the 2nd operation gestalt).

[0052] The trigger information group converter 245 carries out OR processing, and assigns each trigger information corresponding to 14 sensors (generally n pieces) to the group by whom it was beforehand set up of the six groups (generally m (<n) individual). For example, when only a sensor A2 shows trigger information "1" about A group, it is referred to as "1" as input as an A group.

[0053] Here, the mode of grouping is explained. Grouping is performed using a group translation table. For example, the table changed into the group value as a group A from A group's sensor A1 - A4 (four pieces) with the 2nd operation gestalt, The table changed into the group value as a group B from B group's sensor B1 - B4 (four pieces), From C group's sensor C1 (one piece), and D group's sensor D1 (one piece), respectively as a group C The table changed into each group value as a group D (in addition, when the number of sensors is one piece, a table is good also as unnecessary), The table changed into the group value as a group E from E group's sensors E1 and E2 (two pieces), The table changed into the group value as a group F from F group's sensors F1 and F2 (two pieces) is prepared for the translation table memory 116 as the object for input, and an

object for trigger information, respectively. Each group translation table is set up based on the OR processing which outputs "1" as a group value, if a sensor input (again trigger information) shows one "at least 1." And on the occasion of group transform processing by the group converters 244 and 245, processing which acquires a group value using these tables is performed. Furthermore, one translation table from each group to fields Z1-Z3 is needed, and the translation table memory 116 is prepared. The combination in this case becomes the 6th power of 2.

[0054] When such grouping is adopted, in the case of the 2nd operation gestalt, there is an advantage that the memory space according to the combination of the 14th power of 2 can be managed with the square of 2, the memory space for the square of 2 (1 bit each as [Further] a part for Groups C and D), and the memory space according to the 6th power of 2 the 4th power of 2 and the 4th power of 2.

[0055] The changed trigger hysteresis update process section 246 is stored updating the changed trigger information by which the group division (conversion) was carried out to m pieces to RAM117 as changed trigger hysteresis information for the count of predetermined (for example, past 8 batch) (namely, 8 / 60 seconds).

[0056] It performs in connection with having carried out the group division while it considers that this is a chattering noise and it removes it from the changed trigger information that the changed trigger information acquired this time using the stored changed trigger hysteresis information is acquired by the latest, if the changed trigger information noise rejection section 247 is a thing within predetermined time, and it performs similarly the same processing as the noise-rejection section 243 to a group. Moreover, this changed trigger information noise rejection section 247 performs processing which removes the evil generated in connection with grouping. Namely, although it is determined noting that stroke actuation of the field Z1 is carried out eventually when the fields simply chosen from stroke actuation, for example are Z2 and Z3 Supposing the finger by the side of a group from whom fields Z2 and Z3 are chosen immediately after that separates from this actuation condition early, possibility of being processed as if stroke actuation of the group corresponding to a field Z3 was carried out after the field Z1 will come out. When this is not simultaneous with all the fingers that the timing to which a finger separates from the top-face web material 314 hit and a certain finger separates, Since the reverberation by peculiarity which the remaining finger strikes twice and carries out, or top-face web-material 314 grade was also considered, when a field Z1 is chosen Within the same predetermined time as the above, changed trigger information is changed into "0" so that the selection to Z1 to Z2 or Z3 may be canceled.

[0057] Drawing 12 is a flow chart which shows the stroke field judging routine of the stroke actuation detecting element concerning the 2nd operation gestalt.

[0058] First, it is a manipulate signal from 14 sensors (here, generally they may be n pieces) A1-F2 a predetermined time (1 / 60 seconds) period, and incorporation of the input In (in addition, suffix n expresses the sensor number in this operation gestalt) made binary is performed (step ST 11). Subsequently, the trigger information Tn (0->1) is generated from this input In and the last input signal In' (step ST 13), and an update process of the trigger hysteresis Hn is performed from n more trigger information Tn (step ST 15). With this operation gestalt, while storing the trigger hysteresis Hn of past 8 batch serially by the trigger hysteresis update process section 242, the trigger information

Tn newly acquired this time is replaced with and memorized to the trigger information Tn of 8 times ago.

[0059] Then, processing which removes the trigger information (inside of fixed time amount) Tn as unnecessary information is performed using the trigger hysteresis Hn (step ST 17). That is, the noise-rejection section 243 computes the time difference to the trigger information Tn by which updating storage was carried out from the last trigger information Tn with reference to the trigger hysteresis Hn this time, and when calculation results are 3 / less than 60 seconds, this trigger information performs processing which rewrites this to clearance, rewrites this trigger information to "0" as a chattering signal originating in the structure of the sensor section, the actuation situation of a player, etc., and is updated. For example, even if it is one stroke actuation as consciousness of a player, in contact with the top-face web material 314, reverberation etc. is altogether considered by coincidence, and two or more fingers (striking member) which hit the top-face web material 314 remove as a noise the signal which overlaps this short time and is produced.

[0060] The conversion to n input Im as m groups from Input In then, by OR processing It is carried out by being led to the group translation table of the translation table memory 116 with the 2nd operation gestalt (step ST 19). Namely, subsequently The conversion to n trigger information Tm as m groups from the trigger information Tn by OR processing That is, with the 2nd operation gestalt, it is carried out by being led to the group translation table of the translation table memory 116 (step ST 21), and an update process of the changed trigger hysteresis Hm is performed from m more changed trigger information Tm (step ST 23). That is, with the 2nd operation gestalt, while storing serially the changed trigger hysteresis Hm of past 8 batch by the changed trigger hysteresis update process section 246, the changed trigger information Tm newly acquired this time is replaced with and memorized to the changed trigger information Tm of 8 times ago.

[0061] Subsequently, clearance of the same chattering signal as a step ST 17 is performed to the changed trigger information Tm (step ST 25), and clearance processing of the evil accompanying grouping is further performed by the changed trigger information noise rejection section 247 to the changed trigger information Tm using the changed trigger hysteresis Hm (step ST 27). And changed trigger information (Tm) that garbage was removed at steps ST25 and ST27 is made into the final result (step ST 29), it is led to the translation table of the translation table memory 116 changed into a field from a group, and the information which shows a corresponding field is outputted to the assessment section 150.

[0062] Drawing 13 is drawing about the sensor placement and the field which show the modification of the 2nd operation gestalt, and plane view drawing in which (a) shows the configuration of fields Z1-Z3, and (b) are plane view drawings showing arrangement and the group of a sensor. The configuration of a field is the same as that of what is shown in drawing 11 (a), and bilateral symmetry. Sensors total 14 and, as for the arrangement, a sensor A2, A3 and B-2, and the relation to reverse of B3 have become as compared with drawing 11.

[0063] As mentioned above, with the 2nd operation gestalt, since the relation between grouping and a decision field is set up from the measured value hit actually, without changing a field (i.e., without it changing into a sensor in any way), field decision is

attained more at accuracy.

[0064] The following modes can be further used for this invention.

(1) If the structure of a sensor is the sensor which pushes in, and is not limited to the switch of a formula etc. but can detect stroke actuation mechanically, it is good anything.

(2) Although this operation gestalt explained the conga as a percussion instrument to the example as a control unit, what is necessary is just the percussion instrument which is not limited to this but has stroke sides, such as a drum. Moreover, it is not limited to a musical instrument, but various modes are employable if game progress is aimed at to in short hitting to two or more fields on single Men (it striking and containing). Since actuation quick in modes, such as a music game which performs stroke actuation especially according to BGM etc., was required and it was made always in agreement [the location and field which are recognized that the player struck, and a result], it becomes suitable.

(3) A stroke side does not need to be circular and a polygon configuration is sufficient as it. Furthermore, you may be a curved-surface configuration besides a flat surface.

Thereby, applicability spreads.

(4) Perform stroke actuation with a finger or a fist, and also it is good as a mode performed by having been beforehand prepared as a stroke member.

(5) Although three pieces and four examples explained the division field, they should just be at least two or more predetermined numbers.

(6) When carrying out grouping , although [this operation gestalt] OR processing of input and the trigger information be carry out , if the connection (it connect electrically) structure which connect to one the output signal line from the sensor contain in each group for every group be adopt and OR processing be perform , the OR processing by signal processing become unnecessary , and same OR processing can be realize with a easier configuration . In this case, since it corresponds to various kinds of field modes, it is desirable to consider as the mode which equips a part for a connection with a matrix-like switch (connecting means), and can change a connection-related change suitably with each sensor and a group.

[0065]

[Effect of the Invention] According to invention of claim 1 and seven publications, outputted field information can be made into the field by which stroke actuation was carried out without recognition and the sense of incongruity of a player. Moreover, dealing with field setting out various only by changing the content of the translation table only becomes easily possible, without adding modification in any way to the structure of a stroke sensor, and arrangement, i.e., a mechanical part.

[0066] According to invention according to claim 2, the so-called chattering signal is removable.

[0067] According to invention according to claim 3, though it is one percussion instrument which has a single stroke side, by having enabled the stroke judging of two or more fields, it becomes possible to brew the ambient atmosphere of a music performance, and it uses as a music game and becomes suitable.

[0068] According to invention according to claim 4, it becomes possible to brew presence that percussion instruments, such as conga and a drum, are played.

[0069] Since according to invention according to claim 5 a group is once relayed and the field was determined, a translation table serves as relation between a group and a field,

and memory space can be reduced. According to invention according to claim 6, the noise which may be produced as evil accompanying grouping is removable.

[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1] It has the single stroke side where the check by looking of the front face being equipped with i fields was enabled. It is stroke actuation field judging equipment which judges the stroke field on the stroke side over the actuation machine equipped with the stroke sensor of n ($>i$) individual which can detect the existence of the stroke distributed to this stroke side. A trigger conversion means to change into the trigger information which gets to know the existence of initiation of stroke actuation from the detecting signal from each of n stroke sensors detected for every predetermined time, Stroke actuation field judging equipment characterized by having the translation table showing relation with the field determined were hit all the combination of the trigger information corresponding to n stroke sensors, and among said i pieces.

[Claim 2] Stroke actuation field judging equipment according to claim 1 characterized by having a trigger hysteresis storing means to store the trigger information acquired for said every predetermined time by the count of predetermined, and a noise rejection means to remove the trigger information on those with the stroke within the setup time from the trigger information on those with initiation of the last stroke actuation using the stored trigger hysteresis information.

[Claim 3] Said actuation machine is stroke actuation field judging equipment according to claim 1 or 2 characterized by being the controller for game machines which imitated the percussion instrument.

[Claim 4] Said single stroke side is stroke actuation field judging equipment according to claim 1 to 3 characterized by consisting of the 3rd field which nothing and said field are the 1st and 2nd field symmetrical at a near side, and the remainder about a round shape, and makes a center and front side a subject.

[Claim 5] It has the single stroke side where the check by looking of the front face being equipped with i fields was enabled. It is stroke actuation field judging equipment which judges the stroke field on the stroke side over the actuation machine equipped with the stroke sensor of n ($>i$) individual which can detect the existence of the stroke distributed to this stroke side. A trigger conversion means to change into the trigger information which gets to know the existence of initiation of stroke actuation from the detecting signal from each of n stroke sensors detected for every predetermined time, The 1st conversion means which carries out OR processing and assigns each trigger information corresponding to n stroke sensors to the group by whom it was beforehand set up of the groups of m ($n>m>i$) individual, Stroke actuation field judging equipment characterized by having the translation table showing relation with the field determined were hit among all the combination of m groups' changed trigger information, and i fields.

[Claim 6] The 2nd conversion means which carries out OR processing and assigns either of m groups each detecting signal of n stroke sensors, A changed trigger hysteresis

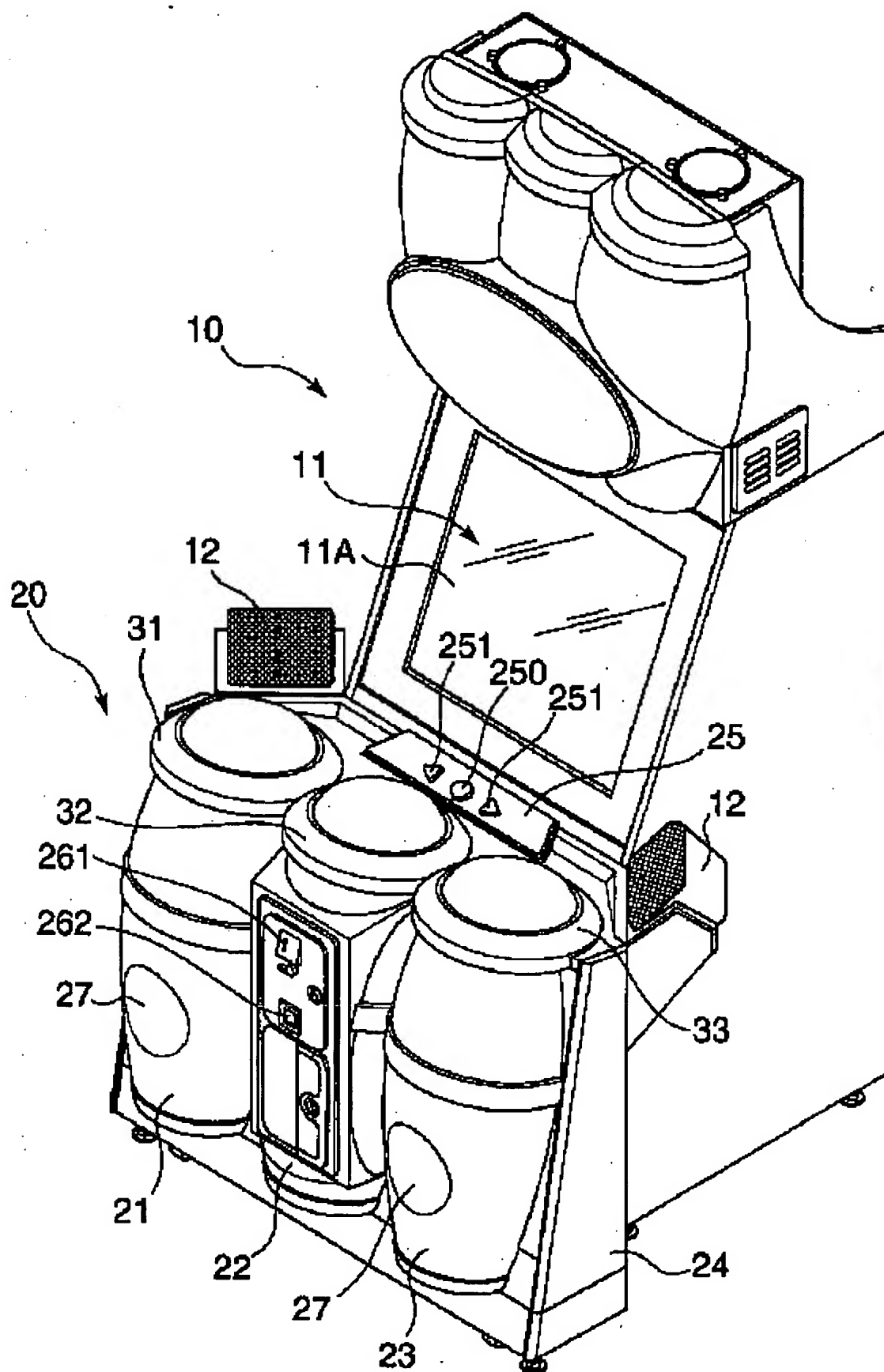
storing means to store the changed trigger information which is the changed trigger information acquired with said 1st conversion means, and was acquired for said every predetermined time by the count of predetermined, Stroke actuation field judging equipment according to claim 5 characterized by having a noise rejection means to remove the changed trigger information on those with initiation of the stroke actuation within the predetermined setup time from the changed trigger information on those with initiation of the last stroke actuation, using the stored changed trigger hysteresis information.

[Claim 7] It has the single stroke side where the check by looking of the front face being equipped with i fields was enabled. It is the stroke actuation field judging approach of judging the stroke field on the stroke side over the actuation machine equipped with the stroke sensor of n ($>i$) individual which can detect the existence of the stroke distributed to this stroke side. It changes into the trigger information which gets to know the existence of initiation of stroke actuation from the detecting signal from each of n stroke sensors detected for every predetermined time. The stroke actuation field judging approach characterized by determining a field from this trigger information through the translation table showing relation with the field determined were hit all the combination of the trigger information corresponding to n stroke sensors, and among said i pieces.

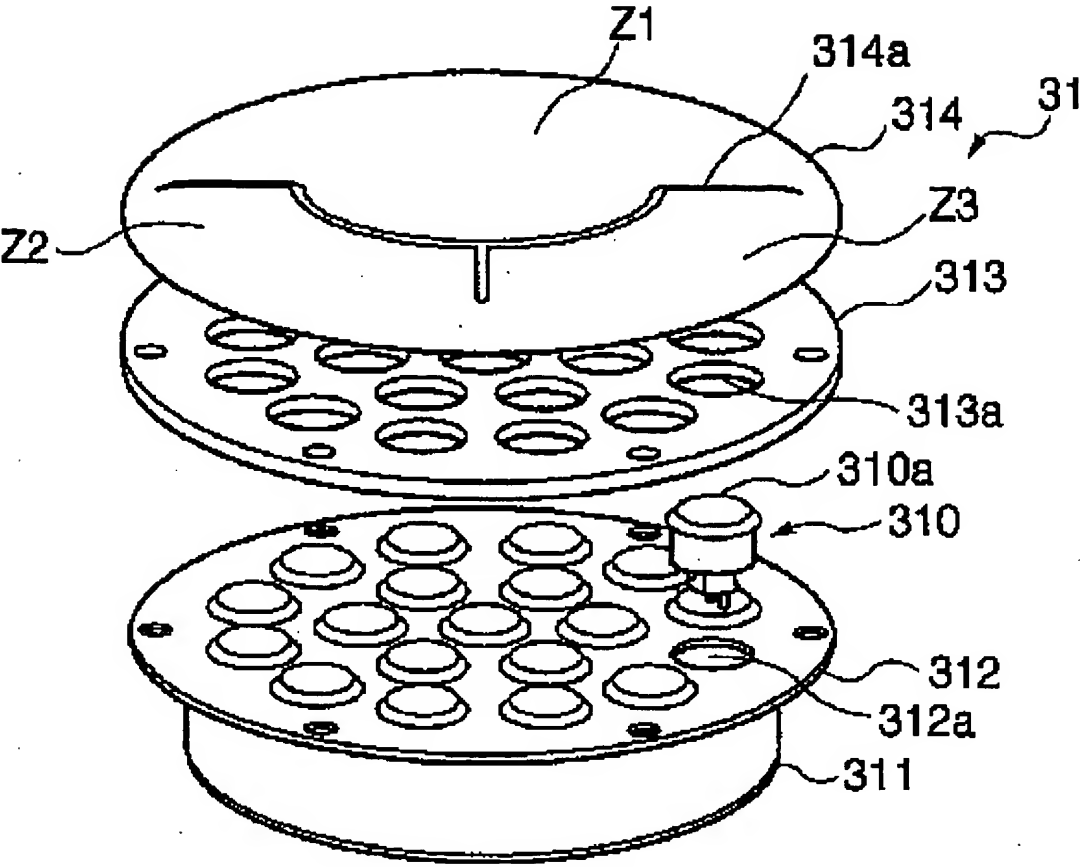
[Claim 8] It has the single stroke side where the check by looking of the front face being equipped with i fields was enabled. It is the stroke actuation field judging approach of judging the stroke field on the stroke side over the actuation machine equipped with the stroke sensor of n ($>i$) individual which can detect the existence of the stroke distributed to this stroke side. It changes into the trigger information which gets to know the existence of initiation of stroke actuation from the detecting signal from each of n stroke sensors detected for every predetermined time. Each trigger information is changed into the group to whom it corresponds of the groups of m ($n>m>i$) individual assigned to n stroke sensors, respectively by OR processing. The stroke actuation field judging approach characterized by determining a field from trigger information [finishing / this conversion] through the translation table showing relation with the field determined were hit among all the combination of m groups' changed trigger information, and i fields.

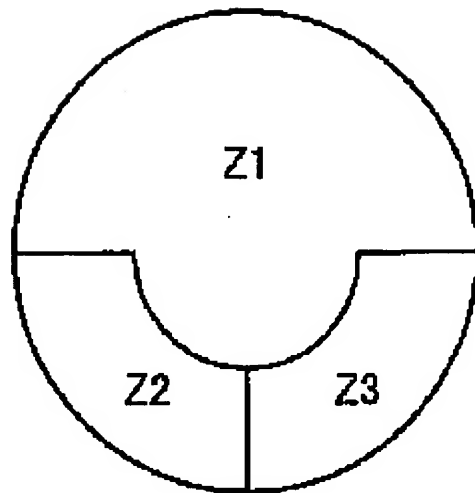
[Translation done.]

Drawing 1



Drawing 2

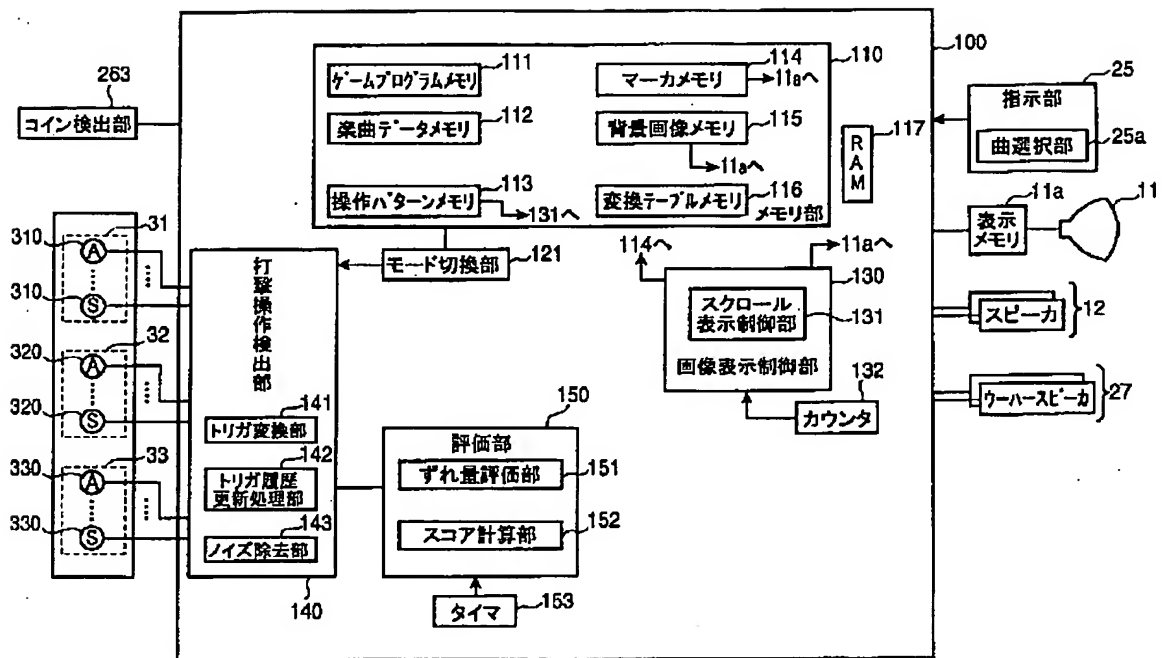




| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | Z1 | Z2 | Z3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|----|----|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| | | | | | | | | | : | | | | | | | | | | | : | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | | | | | | | | | : | | | | | | | | | | | : | |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | | | | | | | | | : | | | | | | | | | | | : | |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| | | | | | | | | | : | | | | | | | | | | | : | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

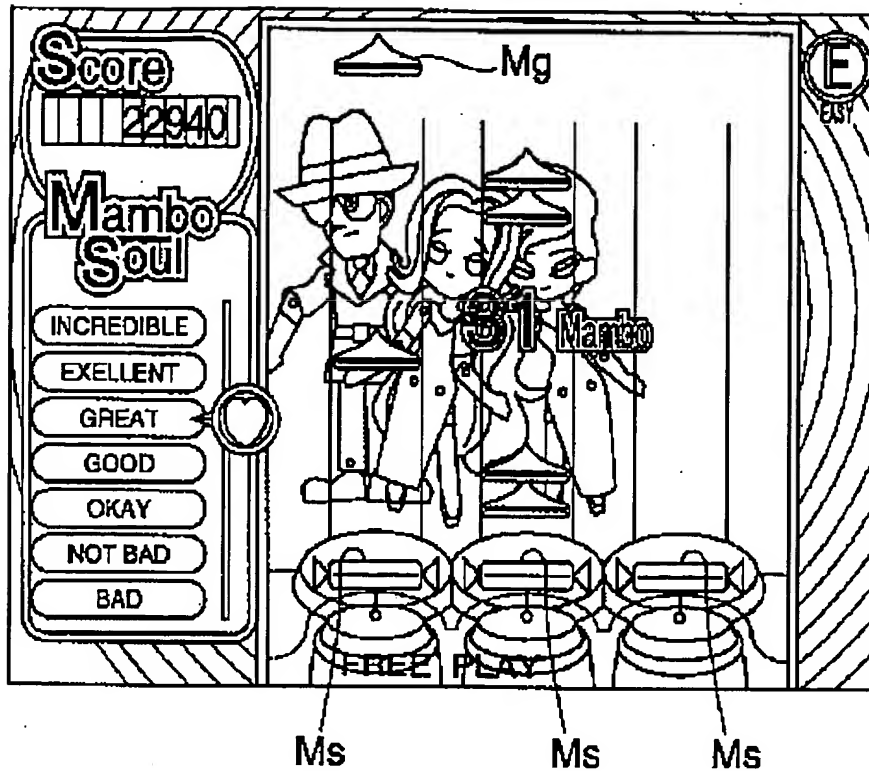
| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | Z1 | Z2 | Z3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|----|----|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| | | | | | | | | | : | | | | | | | | | | | : | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | | | | | | | | | : | | | | | | | | | | | : | |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | | | | | | | | | : | | | | | | | | | | | : | |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| | | | | | | | | | : | | | | | | | | | | | : | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Drawing 4

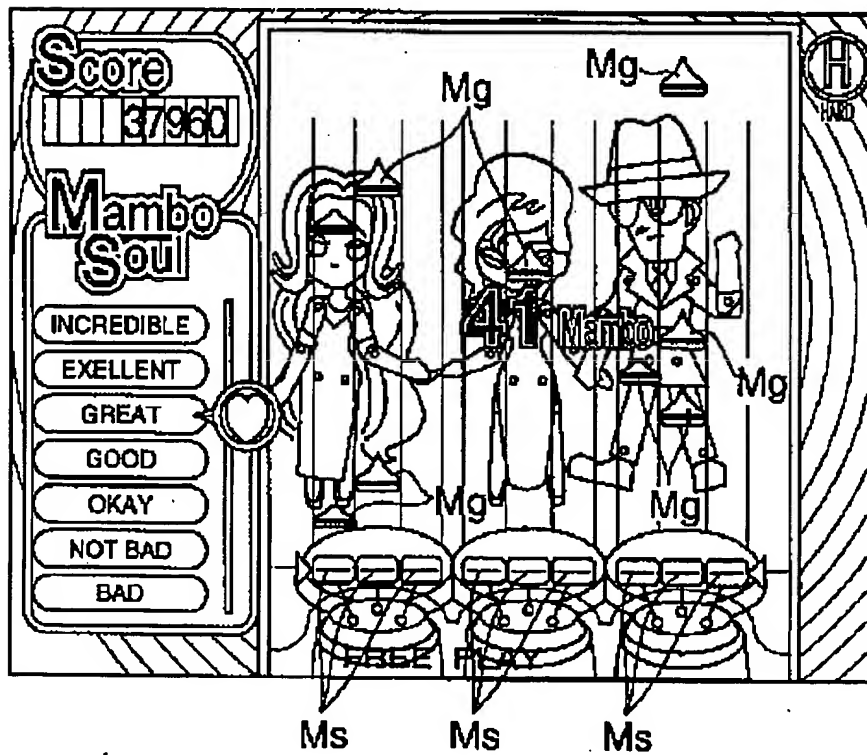


Drawing 5

(a)



(b)



Drawing 6

